



Surgical Outcomes and Recurrence Rates in Far Lateral Lumbar Disc Herniations: A Retrospective Analysis of 91 Cases

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ABSTRACT

Objective: Far lateral lumbar disc herniations are distinct from intracanal herniations in clinical, radiological, and surgical aspects. This study aimed to assess surgical outcomes and recurrence risk factors for far lateral disc herniations treated with trans pars microsurgery.

Methods: Retrospective analysis included patients diagnosed with far lateral disc herniation who underwent Microscopic Transpars Discectomy at our university hospital between 2017 and 2022. Data encompassed demographics, pain characteristics, neurological status, radiological findings, surgical duration, pre/postoperative visual analog scale (VAS) and Oswestry Disability Index (ODI) scores, and late postoperative satisfaction rates.

Results: Of 91 patients (58.2% men, 41.8% women; mean age 57.42 ± 10.47 years), 76.92% had excellent outcomes, 16.48% good, and 6.5% fair; recurrence occurred in 5.5%. No significant differences were found between recurrent and non-recurrent cases in sex, age, herniation side, operation time, or levels ($p > 0.05$). Similarly, there were no significant differences in recurrent cases for pre/postoperative VAS ($p > 0.05$) or ODI scores ($p > 0.05$).

Conclusion: Microdiscectomy performed via transpars intervention is a safe and effective technique for the surgical treatment of far lateral disc herniation; age, sex, herniation level, herniation side, and VAS and ODI scores were not identified as recurrence risk factors.

Keywords: lumbar disc herniation, fusion, microdiscectomy

Far Lateral Lomber Disk Herniasyonlarının Cerrahi Tedavi Sonuçları ve Nüks Oranları: 91 Vakanın Retrospektif Analizi

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ÖZET

Amaç: Far lateral lomber disk herniasyonları klinik, radyolojik ve cerrahi yönlerden kanal içi herniasyonlardan farklılık gösterir. Bu çalışmanın amacı, trans pars mikrodissektomi tekniği ile cerrahi tedavi uygulanan far lateral disk herniasyonlarının cerrahi sonuçlarını ve nüks risk faktörlerini değerlendirmektir.

Yöntem: 2017 ve 2022 yılları arasında üniversite hastanemizde far lateral disk herniasyonu tanısı ve trans pars mikrodissektomi tekniği ile cerrahi tedavi uygulanan hastalar retrospektif olarak değerlendirilmek üzere çalışmaya dahil edildi. Değerlendirilen veriler; demografik ve ağrı özellikleri, nörolojik durum, radyolojik bulgular, cerrahi süre, ameliyat öncesi/sonrası vizüel analog skala (VAS) ve Oswestry Özürlülük İndeksi (ODI) skorları ve geç dönem postoperatif memnuniyet oranlarını kapsıyordu.

Bulgular: 91 hastanın (%58.2 erkek, %41.8 kadın; ortalama yaş 57.42 ± 10.47 yıl), %76.92'si mükemmel, %16.48'i iyi ve %6.5'i orta sonuçlar aldı; nüks %5.5 oranında gözlemlendi. Nüks eden ve etmeyen vakalar arasında cinsiyet, yaş, taraf, ameliyat süresi veya seviyeler açısından anlamlı farklılık bulunmadı ($p > 0.05$). Benzer şekilde, ameliyat öncesi/sonrası VAS ($p > 0.05$) veya ODI skorlarında ($p > 0.05$) nüks vakaları arasında anlamlı farklılık bulunmadı.

Sonuç: Transpars yaklaşım ile mikrodissektomi, far lateral disk herniasyonunun cerrahi tedavisinde güvenli ve etkili bir tekniktir; yaş, cinsiyet, herniasyon seviyesi, herniasyon tarafı ve VAS ile ODI skorları, nüks risk faktörleri olarak tanımlanmadı.

Anahtar Kelimeler: lomber disk herniasyonu, füzyon, mikrodissektomi

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Introduction

Far lateral lumbar disc herniation (FLLDH) is defined as a disc herniation located lateral to the medial wall of the pedicle. FLLDH can be foraminal, intraforaminal, far lateral, and extreme far lateral depending on their localization and are less common compared to disc herniations within the spinal canal. FLLDH constitutes 7%–12% of all herniated discs.¹ FLLDH differs from disc herniations located in the spinal canal by certain characteristics. FLLDHs are more prevalent in the elderly and compress the descending root from the upper segment and have the potential to cause more severe pain because of the likelihood of compressing the ganglion.

The clinical presentation of far lateral lumbar disc herniations and the surgical techniques in use are different. Despite the fact that more invasive techniques, including facetectomy,² were initially used in surgery, there is now a trend toward more minimal techniques because of unsatisfactory results and instability of the former techniques. Today, the most frequently used techniques include microscopic trans-pars discectomy, minimally invasive surgery, tubular discectomy, micro-endoscopic discectomy, and full endoscopic discectomy.

There are several previous studies in the relevant literature on surgical techniques and short- and long-term outcomes of FLLDHs.^{1, 3, 4, 5, 6} However, there are only a limited number of studies with a focus on recurrence and the surgical treatment thereof.⁷ The present study reports the results of far lateral disc herniations operated with trans pars microsurgery, as well as the risk factors, surgery, and outcomes of recurrences.

Materials and Methods

This present retrospectively assessed the patients diagnosed with FLLDH, who underwent surgical treatment with microscopic trans-pars discectomy at our University Hospital between 2017 and 2022.

Ethics committee approval of our university hospital (approval number: E-22686390-050.99-24887) was obtained. Age, sex, pain characteristics, neurological status, radiological features, duration of surgery, preoperative and postoperative visual analog scale (VAS) scores, and follow-up duration were recorded for all the patients. Postoperative patient satisfaction was assessed based on the MacNab classification as excellent (no pain), good (mild pain), fair (moderate pain), and poor (unchanged or more severe pain). The Oswestry Disability Index (ODI) was used to assess the patients' physical capacity in relation to limitation in activities in daily life and returning to work in the pre- and post-operative period.⁸ Radicular pain lasting 4–6 weeks, progressive neurologic deficit, and severe pain not adequately responsive to analgesics were determined as indications for surgery. All patients underwent magnetic resonance imaging (MRI) and FLLDH compressing the upper root were included in the study. Patients with herniation at another level or in the same segment or with stenosis and instability were excluded from the study.

Surgical technique

All the patients were operated in prone position under either spinal or general anesthesia. Upon level determination by fluoroscopy, a 2.5–3 cm incision was made in the midline, fascia was incised, and muscles were dissected. The parts of the upper and lower facet facing the pars and the pars itself were exposed. During the microscopic-assisted procedure, the lamina was advanced using a drill from the lateral aspect of the pars and a 1–1.5 cm laminotomy was performed with a Kerrison Rongeur. The transverse ligament was removed and the upper root was exposed. Based on MRI results, the disc was reached by proceeding according to the localization of the disc compressing the root. The disc fragments were removed and the discectomy procedure was completed. Patients were mobilized after 6 hours. The patients were discharged 1 day later.

Statistical Analyses

The Statistical Package for the Social Sciences (SPSS) software, Version 26, was used for the statistical analysis in assessment of the study results. Accordingly, quantitative variables were represented by mean, standard deviation, median, min and max values, and qualitative variables were represented by descriptive statistical methods, including frequency and percentage. Shapiro Wilks test and Box Plot graphs were used to test the normal distribution hypothesis of the study data.

Mann–Whitney U test was used in the two-group analyses of variables without normal distribution and Wilcoxon Signed Rank test was used for the purpose of intragroup analyses.

The Fisher's Exact test and Fisher Freeman Halton test were used to compare qualitative data.

Results were evaluated at 95% confidence interval and a p value of <0.05 was considered statistically significant.

Results

The study was conducted at our University Hospital between 2017 and 2022 with a total of 91 patients, 58.2% (n = 53) men and 41.8% (n = 34) women. The patients' ages ranged between 39 and 86 years with a mean age of 57.42 ± 10.47 (Table 1).

56% (n = 51) of the patients had herniation on the right side and 44% (n = 40) on the left side upon analysis. The duration of anesthesia operation varied between 1.05 and 2.33 hours in the patients; where the mean duration was 1.48 ± 0.37 hours. Recurrence was observed in 5.5% (5) of the patients. As regards the levels of hernia in the patients, 2.2% (n = 2) were at L1-2, 7.7% (n = 7) at L2-3, 22% (n = 20) at L3-4, 38.5% (n = 35) at L4-5, and 29.7% (n = 27) at L5-S1.

The mean preoperative VAS score of the patients included in the study was 7.26 ± 0.96 , where the mean postoperative VAS score was 1.99 ± 0.77 . The mean preoperative ODI score of the patients was 76.64 ± 12.5 , where the mean postoperative ODI score was 8.76 ± 5.01 .

All patients had radicular pain. Thirty patients (32.96%) had motor deficits. 55 cases (60.43%) presented with sensory changes. The duration of preoperative

complaints ranged from 3 days to 2.5 months. Of the 30 patients with motor deficits, 23 (76.66%) recovered completely, 5 (16.66%) recovered partially, and 2 (6.66%) showed no improvement. Complaints decreased in 32 (58.18%) out of 55 cases with sensory changes. The outcome was excellent in 76.92% (70), good in 16.48% (15), and fair in 6.5% (6) of the patients.

Motor deficit increased in 3 (3.29%) patients post-operatively. Improvement seen within weeks upon introduction of physical therapy. Neuropathic pain persisted postoperatively in 7 patients, who were administered gabapentin treatment for 4 weeks to 6 months. All the patients reported no neuropathic pain or minor symptoms thereof at the end of the above periods. Superficial infection occurred in 2 patients. They recovered upon 10-day antibiotic treatment and wound care.

Post-operative recurrence occurred in 5 patients between Day 20 and 96. The same surgical treatment technique (trans-pars approach and microsurgery) was used in 2 of these patients, and in the other 3 patients, posterior short segment pedicle screw and posterolateral fusion were additionally applied. (Figure-1) One patient, who underwent microsurgical revision had recurrence and received fusion surgery during the 3rd operation.

There was no statistically significant difference in recurrent cases based on sex, age, side, operation time, and disc herniation levels ($p > 0.05$) (Table 2). There was also no statistically significant difference in recurrent cases by preoperative and postoperative VAS scores ($p > 0.05$) (Table 3), and by preoperative and postoperative ODI scores ($p > 0.05$) (Table 4).

Table 1: Distribution of Descriptive Characteristics

	n (%)	
Sex		
Men	53 (58.2)	
Women	38 (41.8)	
Age		
Mean \pm SD		57.42 \pm 10.47
Median (Min-Max)		57 (39-86)
Side		
Right	51 (56.0)	
Left	40 (44.0)	
Duration of op. anesthesia (hours)		
Mean \pm SD		1.48 \pm 0.37
Median (Min-Max)		1.5 (1-2.33)
Recurrence		
No	86 (94.5)	
Yes	5 (5.5)	
Level		
L1-2	2 (2.2)	
L2-3	7 (7.7)	
L3-4	20 (22.0)	
L4-5	35 (38.5)	
L5-S1	27 (29.7)	
Preop VAS		
Mean \pm Sd		7.26 \pm 0.96
Median (Min-Max)		7 (6-9)
Postop VAS		
Mean \pm Sd		1.99 \pm 0.77
Median (Min-Max)		2 (1-3)
Preop ODI		
Mean \pm Sd		76.64 \pm 12.5
Median (Min-Max)		80 (45-100)
Postop ODI		
Mean \pm Sd		8.76 \pm 5.01
Median (Min-Max)		9 (1-20)

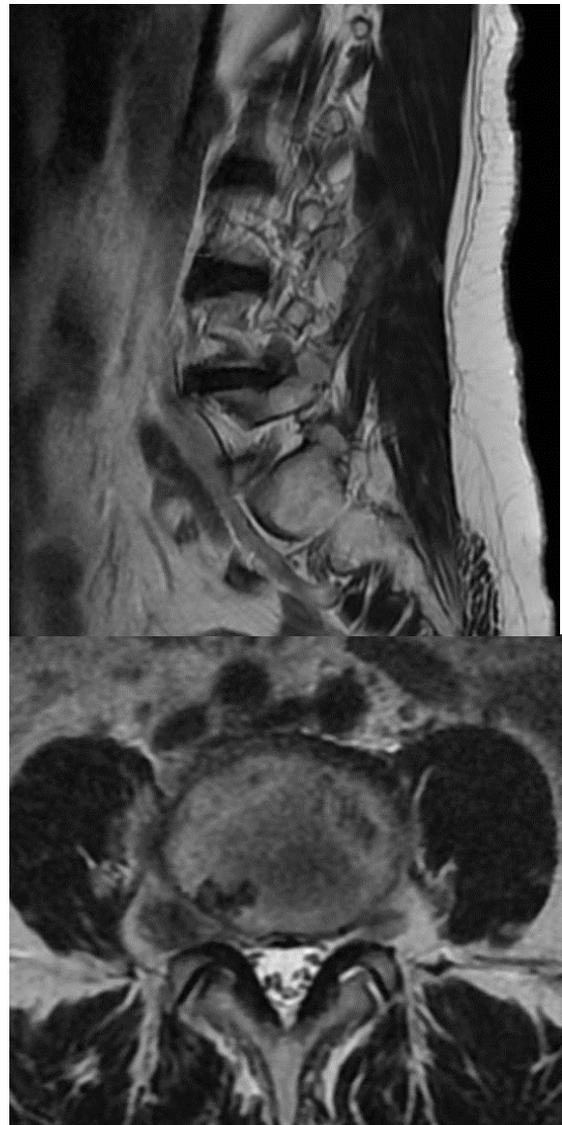


Fig 1 a.b. Preoperative sagittal and axial magnetic resonance images of a 53-year-old female patient with right L4-5 far lateral disc herniation.

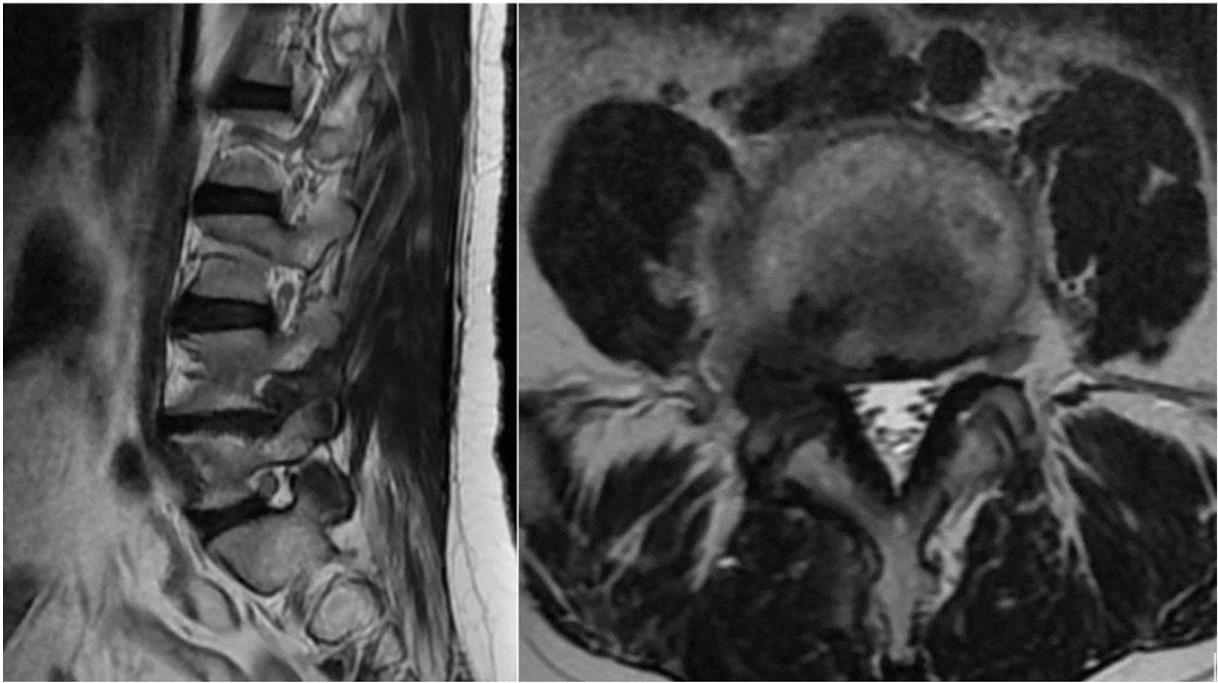


Fig 1 c.d. Lumbar magnetic resonance was performed because the patient had right radiculopathy 11 months after the surgery. Recurrent far lateral lumbar disc herniation was observed on magnetic resonance images

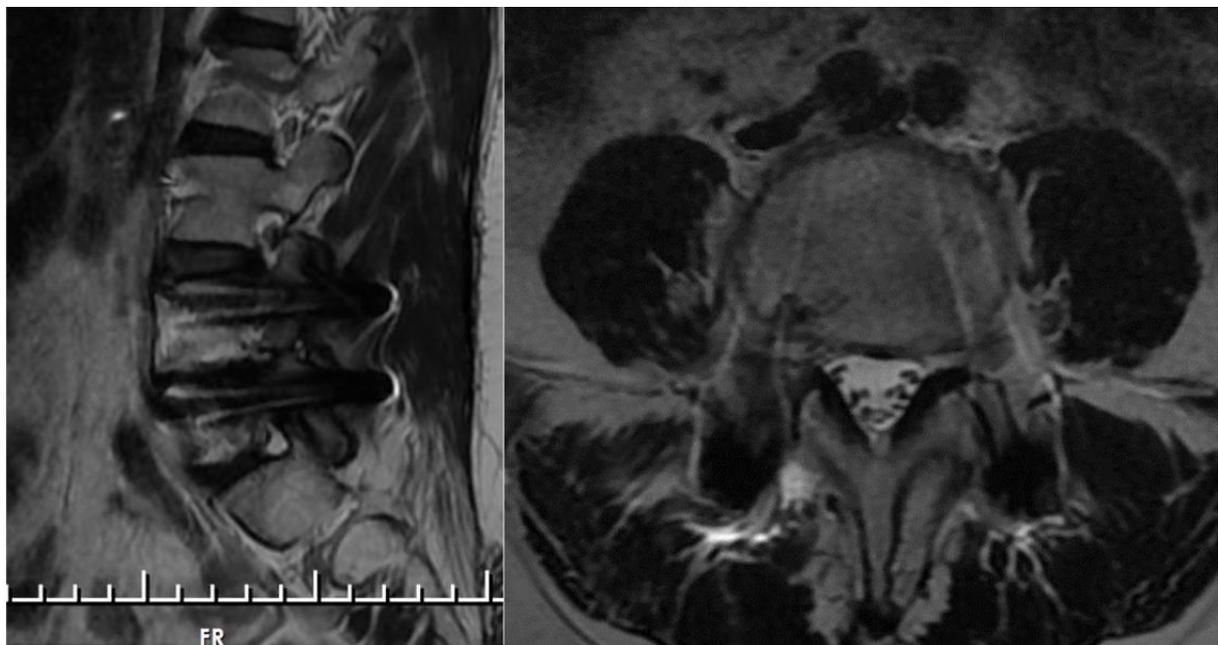


Fig 1 e.f. The patient underwent revision surgery with trans-pars microdiscectomy and fixation surgery with short segment pedicle screw technique. Postoperative sagittal and axial magnetic resonance images.

Table 2: A Comparison of descriptive characteristics between recurrent and nonrecurrent cases.

	Recurrence		p
	No (n=86)	Yes (n=5)	
Sex			
Men	50 (58.1)	3 (60.0)	1.000 ^a
Women	36 (41.9)	2 (40.0)	
Age			
Mean ± SD	57.26±10.65	60.2±7.05	0.418 ^b
Median (Min-Max)	56.5 (39–86)	62 (53–69)	
Side			
Right	49 (57.0)	2 (40.0)	0.651 ^a
Left	37 (43.0)	3 (60.0)	
Duration of operation (hours)			
Mean ± SD	1.47±0.37	1.62±0.46	0.385 ^b
Median (Min-Max)	1.5 (1–2.3)	1.8 (1–2)	
Level			
L1–2	2 (2,3)	0 (0,0)	0.832 ^c
L2–3	7 (8,1)	0 (0,0)	
L3–4	18 (20,9)	2 (40,0)	
L4–5	33 (38,4)	2 (40,0)	
L5–S1	26 (30,2)	1 (20,0)	

a. Fisher Exact Test
b. Mann–Whitney U Test
c. Fisher Freeman Halton Test

Table 3. A comparison of VAS scores between recurrent and nonrecurrent cases

VAS		Recurrence		p
		No (n=86)	Yes (n=5)	
Preop	Mean±SD	7.27±0.98	7.20±0.84	0.964 ^b
	Median (Min-Max)	7 (6–9)	7 (6–8)	
Postop	Mean±SD	2.0±0.77	1.80±0.84	0.571 ^b
	Median (Min-Max)	2 (1–3)	2 (1–3)	
	p	0.001 ^{d,**}	0.038 ^{d,*}	
Difference Δ	Mean±SD	-5.27±1.25	-5.40±0.55	0.712 ^b

b. Mann–Whitney U Test; d. Wilcoxon Signed Rank Test
**p < 0.01 *p < 0.05

Table 4: A comparison of ODI scores between recurrent and nonrecurrent cases

ODI		Recurrence		p
		No (n=86)	Yes (n=5)	
Preop	Mean±SD	76,84±12,53	73,20±12,70	0,488 ^b
	Median (Min-Max)	80 (45–100)	75 (56–85)	
Postop	Mean±SD	8,62±5,02	11,20±4,66	0.270 ^b
	Median (Min-Max)	9 (1–20)	10 (6–17)	
	p	0.001 ^{d,**}	0.043 ^{d,*}	
Difference Δ	Mean±SD	-68,2±13,32	-62,0±12,98	0.299 ^b

b. Mann–Whitney U Test; d. Wilcoxon Signed Rank Test
**p < 0.01 *p < 0.05

Discussion

The surgical treatment of far lateral lumbar disc herniations should aim to relieve pain, remove neurological compression, and maintain stability. Neurologic deficits, neuropathic pain, limitation of daily activity, and recurrences are considered among the most important factors affecting the outcomes of surgical treatment.⁹ Therefore, there is a trend associated with the increased use of minimally invasive techniques in the surgical treatment of far lateral lumbar disc herniations. Furthermore, there are different approaches in use, including the trans-pars approach, paravertebral muscle separation approach, and endoscopic approach.^{4,5,10} There is no consensus with regard to the surgical technique of choice. Each approach is associated with particular advantages and disadvantages.

The risk factors for recurrent herniation upon surgical treatment of far lateral disc herniations, re-operation techniques and especially the outcomes of re-operation have not yet been sufficiently discussed in the relevant literature. There are only a limited number of suggestions on whether the factors that affect the occurrence of intra-canal herniations are also active in the far laterals. Chang SB et al. reported 9 recurrent cases out of 184 patients, who underwent micro-decompression by lateral intermuscular access.¹¹ They reported that double herniations (both intra-canal and far lateral coexistence) were more likely to have a poor outcome where factors, including age and sex did not affect the poor outcome. Recently, Monticelli et al. reported 6 recurrent cases and performed surgery in 5 of them in a series of 135 cases, which underwent surgical treatment via trans-pars.⁷ Consistently, they reported that the variables (age/sex/body mass index (BMI)/treated level) did not affect the outcome.

Park et al. reported 209 (11%) recurrent cases in patients who underwent transforaminal endoscopic lumbar disc decompression in a series of 1900 cases and suggested that small herniations recurred more frequently.¹² They further reported that recurrences usually occurred within the first month and even 12.9% occurred during the first 24 hours of surgery. They reported that age, sex, diabetes mellitus (DM), hypertension (HTN), smoking status, BMI, nature of disc herniation, modic changes, migration grade, height of herniated disc, and spondylolisthesis had no effect on recurrence. Similarly, in the present study, age, sex, herniation segment level, side of herniation, and duration of surgery were not risk factors for recurrence.

It is considered that surgical treatment of recurrent far lateral lumbar herniation is challenging. For intra-canal recurrent herniations, it may be possible to dissect the dura and root relatively mesial to the facet when a fibrotic area is encountered at the laminotomy site. Otherwise, as we and certain other authors suggest, it is possible to fix the root caudally over the foramen, dissect it and exclude it. The surgical treatment of far lateral disc herniations differs on the grounds that there are no similar anatomical

structures in the surgical field. We found advanced fibrosis between the root and the inferior facet in all cases of recurrent far lateral herniations. As have been reported by certain authors, dissecting this fibrotic tissue can prove to be a highly challenging process.¹ Therefore, it was possible to access the disc fragments upon dissection from the upper edge of the inferior facet, which was safer.

Previous studies in the relevant literature included different surgical techniques of choice for the revision surgery of far lateral lumbar disc herniations. Chang SB et al. reported 9 recurrent cases, who received revision surgery thereafter.¹¹ Revision discectomy was the surgical technique of choice in 1 case, total disc replacement in 1 case and fusion in 7 cases. Recently Alhashash M et al. used the Extra-laminar microscopic-assisted percutaneous nucleotomy technique in a series of 50 cases.¹³ There were 2 recurrent cases. These two cases were reoperated using the same technique. Sasani et al. performed percutaneous discectomy in 66 cases and reported three recurrent cases.¹⁴ They opted for microsurgery for the reoperation of recurrent cases. In their series of 22 cases, Thomas Lübbers et al. removed only L 5-S 1s using the percutaneous endoscopic surgery technique. One patient with recurrent hernia was re-operated by open surgery.⁹

Another issue of the ongoing debate is whether only extruded or free fragments should be removed in far lateral discs or the disc space should be evacuated. Chan Hong Park et al. reported that inaccessible fragments and inadequate decompression during surgery were associated with early recurrences.¹² Therefore, they suggested that it was critical to remove both extruded and accessible basal fragments. In the cases included in the present study, if the laminotomy area provided access to the disc space, if the post longitudinal ligament was ruptured in that area and a fragment was observed in the distance where there was a risk of rupture, the disc space was entered and the disc space was evacuated. Only the compressing disk fragments were removed, where the above conditions were not met.

Upon a review of the relevant literature, the recurrence time for intracanal lumbar discs varies between 1 and 5 years, where this period is slightly shorter in recurrent far lateral disc herniations (1 day to 32 months).^{3,11, 12, 13} In the series included in this study, postoperative recurrence occurred in 5 patients between the 20th and 96th days. It was reported that the cause of early recurrences was associated with insufficient fragment removal or inadequate decompression.¹²

In the series included in the previous studies, different techniques were used for revision surgeries of recurrent cases. These techniques were the same as the first surgical technique, that is, endoscopic, microsurgery, etc., or fusion surgery was the technique of choice. It was not clear which technique should be applied due to the limited research on this subject. There were 5 recurrent cases in the series included in the present study. In 2 cases, microscopic trans-pars technique was used for revision surgery, where pedicle screw fixation and posterolateral

fusion surgery was opted for the remaining 3 cases. One of the cases, who underwent microscopic trans-pars procedure, developed recurrence and pedicle screw fixation and posterolateral fusion were performed in the same way subsequently.

Limitation

Certain parameters, including intervertebral disc height, facet angle, herniation size, amount of fragments removed, BMI, DM, and HTN were not included in this study. These need to be taken into consideration as they may have an effect on recurrence. The present study was designed as retrospective research, future prospective studies may contribute to a better understanding of the subject. It is necessary to perform a multi-center study with an adequate sample size, in order to compare the surgical techniques applied in recurrent far lateral lumbar disc herniations. In our cases, fusion approach was the most frequently used technique for the surgical treatment of recurrences. The outcomes of revision surgery without fusion procedure should be monitored.

Conclusion

The microsurgical trans-pars procedure is a safe and effective option for the surgical treatment of far lateral lumbar disc herniations. Surgical removal of far lateral disc prolapse can be performed at all lumbar levels with minimal bone resection without the risk of instability and without restrictions. Age, sex, level, side of hernia development, and VAS and ODI scores were not risk factors for recurrence.

Conflict of Interest

The authors declared they do not have anything to disclose regarding conflict of interest with respect to this manuscript.

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